

# Undertreatment of people with major depressive disorder in 21 countries\*

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## Background

Major depressive disorder (MDD) is a leading cause of disability worldwide.

## Aims

To examine the: (a) 12-month prevalence of DSM-IV MDD; (b) proportion aware that they have a problem needing treatment and who want care; (c) proportion of the latter receiving treatment; and (d) proportion of such treatment meeting minimal standards.

## Method

Representative community household surveys from 21 countries as part of the World Health Organization World Mental Health Surveys.

## Results

Of 51 547 respondents, 4.6% met 12-month criteria for DSM-IV MDD and of these 56.7% reported needing treatment. Among those who recognised their need for treatment, most (71.1%) made at least one visit to a service provider. Among those who received treatment, only 41.0%

received treatment that met minimal standards. This resulted in only 16.5% of all individuals with 12-month MDD receiving minimally adequate treatment.

## Conclusions

Only a minority of participants with MDD received minimally adequate treatment: 1 in 5 people in high-income and 1 in 27 in low-/lower-middle-income countries. Scaling up care for MDD requires fundamental transformations in community education and outreach, supply of treatment and quality of services.

## Declaration of interest

In the past 3 years, R.C.K. received support for his epidemiological studies from Sanofi Aventis, was a consultant for Johnson & Johnson Wellness and Prevention and served on an advisory board for the Johnson & Johnson Services Inc. Lake Nona Life Project. R.C.K. is a co-owner of DataStat Inc., a market research firm that carries out healthcare research.

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The Global Burden of Disease 2010 Study indicated that major depressive disorder (MDD) ranked as the second leading cause of years lived with disability in the world and the first to fourth leading cause (out of nearly 300 considered) in each region of the world.<sup>1</sup> These high estimates are because MDD has both high prevalence (estimated by the Global Burden of Disease 2010 investigators to be the 19th most common disease in the world)<sup>1</sup> and high severity, and a relatively high proportion of individuals with long illness duration.<sup>2–4</sup> Only a minority of people with MDD receive any treatment, despite MDD being a leading cause of disability that also significantly worsens the impact of comorbid non-communicable diseases.<sup>5,6</sup> There is an increasing awareness that MDD can be reliably diagnosed and treated in primary care settings using antidepressant medications and/or brief structured psychological therapies,<sup>7</sup> but substantial barriers exist to this care being delivered. These include supply-side factors (for example, policies to invest resources, and consequent scarce mental health services, community and human resources), as well as demand-side issues (for example, lack of awareness of MDD as a treatable illness, and stigma and social exclusion associated with lower rates of help-seeking).<sup>8,9</sup> Substantial economic costs are the consequence both for people with MDD<sup>10</sup> and for society,<sup>11</sup> because of low rates of treatment and recovery.<sup>12</sup> In this context, the aim of this paper is to present findings from the World Mental

Health (WMH) Surveys quantifying: (a) the 12-month prevalence of DSM-IV<sup>13</sup> MDD in household surveys in 21 countries worldwide; (b) the proportion of those people who are aware that they have a problem serious enough to need treatment and who believe that treatments exist that could help them; (c) the proportion of the latter individuals who actually receive treatment ('contact coverage'); and (d) the proportion of this treatment that meets minimal standards for adequacy.

## Method

### Participants

Data come from the World Health Organization (WHO) WMH surveys, a series of 23 community epidemiological surveys administered in 21 countries. These included 10 countries classified by the World Bank in 2009<sup>14</sup> as low or middle income (Brazil, Bulgaria, Colombia, Iraq, Lebanon, Mexico, Nigeria, Peoples Republic of China (PRC), Peru and Romania) and 11 high income (Argentina, Belgium, France, Germany, Israel, Italy, Japan, Netherlands, Portugal, Spain and the USA). The majority of surveys were based on nationally representative household samples. Three were representative of all urban areas in their countries (Colombia, Mexico, Peru); two were representative of selected regions in their countries (Japan, Nigeria); and four were representative of selected metropolitan areas in their countries (Sao Paulo in Brazil; Medellin in Colombia; Murcia in Spain; Beijing-Shanghai in PRC).

\*The paper is submitted on behalf of the World Health Organization World Mental Health Survey collaborators – see the Appendix for details.

Trained lay interviewers administered the interviews face to face in the homes of respondents aged 18 years or older and assessed MDD using a fully structured diagnostic interview that produces validated diagnoses of common DSM-IV disorders.<sup>13</sup> Standardised interviewer training and quality-control procedures were used in each survey. Informed consent was obtained before administering interviews. The institutional review boards of the organisations coordinating the surveys approved and monitored adherence with procedures for informed consent and protecting human participants. Full details of the WMH Survey methodology are available elsewhere.<sup>15</sup>

To reduce respondent burden, the interview was divided into two parts. Part I, which assessed core mental disorders including MDD, was administered to all respondents. Part II, which assessed additional disorders and correlates including service use, was administered to all Part I respondents who met criteria for any Part I disorder plus a probability subsample of other Part I respondents. Part II interviews, the focus of the current report, were weighted by the inverse of their probabilities of selection into Part II and additionally weighted to adjust samples to match population distributions on the cross-classification of key sociodemographic and geographic variables. Further details about WMH sampling and weighting are available elsewhere.<sup>15</sup>

## Measures

### Mental disorders

Mental disorders were assessed with the WHO Composite International Diagnostic Interview (CIDI) Version 3.0,<sup>16</sup> a fully structured lay-administered interview generating lifetime and 12-month prevalence estimates of 20 mood, anxiety, behaviour and substance use disorders. The WMH CIDI interview translation, back-translation and harmonisation protocol required culturally competent bilingual clinicians to review, modify and approve key phrases describing symptoms.<sup>17</sup> However, no attempt was made to go beyond DSM-IV criteria to assess depression-equivalents that might be unique to specific countries. The latter expansion might have led to a change in results, although previous research has shown that the latent structure of major depression is quite consistent across countries.<sup>18–20</sup> Masked clinical reappraisal interviews with the Structured Clinical Interview for DSM-IV (SCID)<sup>21</sup> were carried out in four WMH countries. Good concordance was found with diagnoses based on the CIDI.<sup>22</sup> MDD was defined as meeting lifetime DSM-IV/CIDI criteria for a major depressive episode and not meeting lifetime DSM-IV/CIDI criteria for broadly defined bipolar disorder (bipolar I–II or subthreshold). As detailed elsewhere,<sup>23</sup> our definition of subthreshold bipolar disorder includes both hypomania without history of a major depressive episode and subthreshold hypomania with a history of a major depressive episode.

### Treatment

Respondents were asked whether they ever obtained professional treatment for ‘problems with their emotions, nerves or use of alcohol or drugs’ and, if so, whether they did so in the past 12 months. Those with 12-month treatment were asked whether they saw a mental health specialty treatment provider (psychiatrist, psychologist, other mental health professional in any setting, social worker or counsellor in a mental health specialty treatment setting, used a mental health hotline), general medical treatment provider (primary care doctor, other general medical doctor, any other healthcare profession seen in a general medical setting) or non-medical treatment provider (religious or spiritual advisor,

social worker or counsellor, any other type of healer) for a mental health problem. The treatment provider categories offered were the same across countries. A more detailed description of WMH 12-month treatment measures is presented elsewhere.<sup>24</sup>

The analyses reported here focus on respondents who met DSM-IV criteria for MDD at some time in the 12 months before interview. The definition used of minimally adequate treatment was that of Wang *et al*,<sup>24</sup> using evidence-based guidelines<sup>25–27</sup> that consisted of receiving either pharmacotherapy ( $\geq 1$  month of a medication, plus  $\geq 4$  visits to any type of medical doctor) or psychotherapy ( $\geq 8$  visits with any professional including religious or spiritual advisor, social worker or counsellor). The decision to have four or more physician visits for pharmacotherapy was based on the fact that for medication assessment, initiation and monitoring, four or more visits are generally recommended during the acute and continuation phases of treatment. We required at least eight sessions for psychotherapy based on the fact that clinical trials showing efficacy have generally included eight or more visits. Any respondent in continuing treatment was regarded as having met this definition.

## Statistical analyses

Survey sampling weights were applied in all analyses so that respondents reflected nationally representative samples in terms of sociodemographic characteristics within each country. Standard errors were estimated using the Taylor series linearisation method implemented in the SAS software survey procedures to adjust weighting and clustering. To test for differences between high-income, upper-middle-income, and lower-middle- and low-income country groups, in relation to the key variables of interest related to the aims of the paper,  $\chi^2$  tests were applied. Statistical significance was evaluated using two-sided 0.05-level tests.

## Results

The characteristics of the study sites are shown in Table DS1. The weighted average response rate across all countries was 71.2%. A total of 51 547 respondents were assessed for 12-month MDD and treatment.

### Prevalence rates

Across all countries, an average of 4.6% of respondents met 12-month criteria for DSM-IV/CIDI MDD (Table 1). As in most community epidemiological surveys, MDD prevalence was higher in high-income (5.2%), than upper-middle-income (4.7%) or low-/lower-middle-income (3.2%) countries. Given what we know about sample bias, reporting bias and CIDI validity, these are likely conservative estimates.

### Recognition of need for treatment

An average of 56.7% respondents with 12-month MDD across surveys reported that they recognised that they needed treatment. It is noteworthy that this recognition is greater in high-income (64.9%), than upper-middle-income (52.2%) countries and is substantially lower in low-/lower-middle-income countries (34.6%). This means that only one out of every three people with depression in low-/lower-middle-income countries recognised a need for treatment.

### Obtaining treatment once need is recognised

Among people with depression who recognised their need for treatment, most (71.1%) made at least one visit to some service

**Table 1** Twelve-month prevalence of major depressive disorder (MDD), perceived need for treatment, receipt of any treatment and receipt of minimally adequate treatment

Country by income category <sup>a</sup>	% (s.e.)					n <sup>b</sup>
	A, % with 12-month diagnosis of MDD	B, % of those in A who had a perceived need for treatment	C, % of those in B with a 'perceived need' who received any 12-month treatment	D, % of those treated in C who received minimally adequate treatment	E, % of those in A who received minimally adequate treatment	
I. High income						
Belgium	5.2 (0.7)	64.7 (7.4)	81.7 (4.8)	55.7 (8.9)	29.5 (6.0)	105
France	5.6 (0.7)	59.3 (4.5)	79.5 (3.8)	48.7 (7.4)	23.0 (4.9)	158
Germany	3.1 (0.3)	60.6 (7.4)	78.5 (3.9)	66.3 (4.0)	31.6 (4.2)	109
Israel	5.9 (0.4)	54.0 (3.0)	72.5 (3.5)	40.3 (4.3)	15.8 (2.2)	280
Italy	2.9 (0.2)	52.3 (5.0)	73.5 (4.6)	43.4 (5.5)	16.7 (3.7)	119
Japan	2.4 (0.3)	50.4 (7.7)	80.1 (1.9)	54.9 (2.8)	22.2 (5.0)	81
Murcia, Spain	6.9 (0.5)	72.6 (4.8)	89.0 (3.5)	29.2 (5.3)	18.8 (3.5)	154
The Netherlands	4.9 (0.7)	61.0 (7.1)	82.0 (5.2)	66.2 (6.9)	33.1 (5.1)	125
Portugal	7.0 (0.5)	65.4 (2.6)	88.3 (1.6)	32.5 (4.1)	18.8 (2.7)	290
Spain	3.8 (0.3)	74.2 (3.4)	79.5 (4.2)	46.0 (5.1)	27.2 (3.2)	231
USA	6.7 (0.3)	74.0 (1.5)	77.4 (2.6)	46.4 (3.1)	26.6 (1.9)	646
Argentina	3.7 (0.5)	66.4 (4.7)	55.3 (4.1)	48.9 (3.3)	17.9 (2.7)	170
Total	5.2 (0.1)	64.9 (1.1)	77.9 (1.2)	44.2 (1.6)	22.4 (1.0)	2468
II. Upper-middle income						
São Paulo, Brazil	10.1 (0.7)	56.1 (3.4)	63.8 (2.7)	41.7 (5.4)	14.9 (2.0)	489
Bulgaria	3.0 (0.3)	50.7 (4.0)	63.3 (3.8)	21.0 (6.3)	6.7 (2.3)	145
Lebanon	4.9 (0.7)	41.0 (3.3)	56.8 (6.9)	30.3 (6.2)	7.0 (1.7)	126
Medellin, Colombia	3.8 (0.4)	51.7 (4.9)	53.5 (7.7)	32.4 (7.3) <sup>c</sup>	9.0 (2.7)	151
Mexico	3.7 (0.3)	58.3 (3.5)	43.4 (4.5)	25.4 (2.9)	6.4 (1.5)	231
Romania	1.5 (0.3)	23.8 (7.3)	90.3 (3.5)	63.0 (14.6)	13.5 (7.5)	40
Total	4.7 (0.2)	52.2 (1.9)	59.6 (1.9)	36.7 (3.5)	11.4 (1.2)	1182
III. Lower-middle income						
Colombia	5.3 (0.4)	49.2 (4.7)	41.3 (6.1)	24.6 (9.4)	5.0 (2.4)	241
Iraq	3.9 (0.4)	17.0 (3.9)	69.7 (2.0)	20.7 (0.7)	2.5 (2.4)	182
Nigeria	1.1 (0.2)	22.3 (3.0)	86.0 (6.3)	0.0 (●)	0.0 (●)	72
Peru	2.7 (0.3)	60.3 (6.1)	50.6 (5.7)	2.8 (2.9)	0.9 (0.9)	99
Beijing/Shanghai, PRC	2.0 (0.4)	39.3 (8.8)	60.3 (12.7)	● (●)	● (●)	87
Total	3.2 (0.2)	34.6 (2.5)	52.6 (3.4)	20.5 (3.4)	3.7 (1.6)	681
IV. Total all countries	4.6 (0.1)	56.7 (1.0)	71.1 (1.0)	41.0 (1.4)	16.5 (0.7)	4331

PCR, People's Republic of China; ●, number could not be estimated because of sparse sampling/low responses.

a. See footnotes to online Table DS1 for an explanation of why Colombia appears in two categories.

b. Number meeting criteria for MDD.

c. 20.1 (5.1).

provider for their emotional problems (including visits to religious advisors or traditional healers). Again, there was a gradient, with the treatment proportions being much higher in high-income (77.9%), than upper-middle- (59.6%), or low-/lower-middle-income (52.6%) countries.

### Treatment adequacy

Among patients who received treatment, 41.0% met criteria for minimally adequate treatment, again with a gradient by country income (44.2%, 36.7% and 20.5%, respectively in high-, upper-middle-, and low-/lower-middle-income countries). Among people with MDD (i.e. those who did or did not receive treatment) only 16.5% received minimally adequate treatment (22.4%, 11.4% and 3.7%, respectively, in high-, upper-middle-, and low-/lower-middle-income countries).

The results for differences between high-income, upper-middle-income, and lower-middle- and low-income country groups showed that all countries within an income group were significantly different from other country groups at the  $P < 0.001$  level for all of the five treatment-related variables shown in Table 1 namely: 12-month prevalence of MDD; perceived need for treatment; any treatment received in 12 months; and the two measures of minimally adequate treatment.

### Discussion

These results show that several different classes of barriers exist to people with MDD receiving minimally adequate treatment and that the combined effect of these barriers is that only a small minority of people with MDD receive minimally adequate treatment.

### Limitations

Several limitations of this study need to be kept in mind in interpreting these results. The response rates in the WMH surveys varied widely and included some response rates that fell below levels usually considered acceptable. We attempted to control for differential response through post-stratification adjustments, but it remains possible that survey response was related to the presence and severity of mental disorders or treatment in ways that were not corrected.

A second potential limitation is that the reliability and validity of diagnoses made with the WMH CIDI may vary across countries. Although acceptable concordance has been observed between diagnoses made with the CIDI compared with masked clinical re-interviews, such studies have been conducted exclusively in Western countries. It remains possible that the accuracy of CIDI diagnoses could be worse in other countries.

One distinct possibility is that there may be a lower relevance of CIDI symptom descriptions in non-Western cultures or greater reluctance to disclose or endorse having emotional problems. For example, some people with a major depressive episode might not have experienced this as primarily emotional, and may rather have understood this as disordered sleep or as somatic distress.

Third, without corroborating data on service use we cannot determine the accuracy of self-reported treatment use or how this validity may differ across specific sectors or clinical, socio-demographic and cultural groups. WMH surveys attempted to minimise such inaccuracies by using commitment probes (i.e. questions measuring a participant's commitment to the survey) and excluding respondents who failed to endorse that they would think carefully and answer honestly. Nevertheless, potentially biased recall of service use remains possible and may have led to underestimation of unmet need for treatment. Finally, in spite of the unprecedented scope and size of the WHO WMH survey initiative, some analyses involved small numbers of respondents, leading to imprecision of some estimates.

Fourth, there were diminishing response rates within countries as income increases. As many of the results are discussed in terms of income categories, this is a potential confounding factor for the findings. It is possible that the differences across income categories are actually a reflection of greater selection bias in high-income countries, with participants with greater service use potentially being more likely to respond to the survey.

Fifth, some of these surveys were conducted over a decade ago, and it is possible that treatment rates in these countries may have changed substantially since then. We consider this unlikely however, since periodic data on service provision collected for WHO ATLAS and AIMS purposes shows relatively few such changes over the recent decade.

## Implications

Within these constraints, the results support previous reports in identifying a large 'treatment gap' for people with MDD.<sup>28,29</sup> Notably the overall prevalence rates of MDD are somewhat greater in high- than in middle- or low-income countries, yet all the service utilisation rates are far worse in the low-income settings, namely the perceived need for treatment among people with MDD, and the proportions of people with MDD who receive any, or any minimally adequate treatment. The issue of perceived need for treatment is especially intriguing, as the results show that in overall terms even if acceptable treatment were available to people with MDD, only about a half (56.7%) felt that they had a need for treatment, and that this proportion fell to about a third (34.6%) in low-/lower-middle-income countries. Previous research shows that this recognition is related to the persistence and severity of depression and is higher among women, the young and people with higher education.<sup>30</sup> This strongly suggests that efforts to decrease the treatment gap for depression need to address both scaling up the supply of services and supporting people with depression and their family members to recognise that they have the condition and that it is treatable.

Calls for scaling up mental healthcare to date have insufficiently emphasised the quality of services.<sup>31</sup> Although the criteria used in this study to assess the minimal adequacy of treatment were *ad hoc* and may need to be refined in future, the results indicate clearly that there are grounds to consider much treatment currently provided to people with MDD ('contact coverage') as falling short of the criteria for evidence-based treatment ('effectiveness coverage').<sup>32</sup> One consequence of failing to attend to the quality of care is that this may contribute to low rates of help-seeking if local services for people with mental

illness have a poor reputation, and another consequence is likely to be high rates of treatment drop-out before treatment is completed.<sup>33</sup> Quality improvement initiatives, such as the widespread adoption of the evidence-based WHO mhGAP Intervention Guide, are needed to deal with these problems.<sup>7,34,35</sup>

Providing treatment at the scale required to treat all people with MDD is an imperative, not only for decreasing disability and death by suicide, but also from a moral and human rights perspective.<sup>36</sup> These WMH survey findings make it clear that success in attacking the problem of unmet need for treatment of people with MDD will require addressing issues at several levels: low rates of recognition of their problem by people with depression, low rates of consultation by people who do recognise that they have such a mental illness, barriers to access treatment<sup>37</sup> and poor treatment adequacy. Each of these problems requires a distinct intervention, or set of interventions, and all of these interventions are necessary to improve access to quality treatment for people with depression, including e-health and m-health treatment options that may be relevant in low- and middle-income countries. None of these alone will suffice.

The Comprehensive Mental Health Action Plan 2013–2020 adopted by the World Health Assembly<sup>38</sup> provides the political commitment for these actions, although the human and financial resources deployed within most low- and middle-income countries are still too low to achieve improvement in the provision of treatment for MDD and other mental disorders. In the recently adopted United Nations Sustainable Development Goals, mental health was for the first time explicitly recognised within the concept of Universal Health Coverage.<sup>39,40</sup> It is clear that providing effective services for people with depression, integrated into general health services, is a vital element of basic healthcare provisions.<sup>41</sup> As we now have evidence for effective and feasible interventions suitable for low-, middle- and high-income countries,<sup>7</sup> we call upon national and international organisations to make firm and time-bound commitments to make adequate resources available for scaling up the provision of mental health services so that 'no one is left behind'.<sup>39</sup>

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## Appendix

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## Data supplement

Table DS1 World Mental Health (WMH) sample characteristics by World Bank income categories<sup>a</sup>

Table Ds1 World Mental Health (WMH) sample characteristics by World Bank income categories <sup>a</sup>							
Country by income category		Survey	Sample characteristics <sup>b</sup>	Field dates	Age range	Sample size Part 1Part 2	Response rate <sup>c</sup>
I. Low- and lower-middle income							
Colombia	NSMH	All urban areas of the country (approximately 73% of the total national population) Nationally representative 21 of the 36 states in the country, representing 57% of the national population. The surveys were conducted in Yoruba, Igbo, Hausa and Efik languages Beijing and Shanghai metropolitan areas All urban areas of the country		2003	18-65	4426	87.7
Iraq	IMHS			2006-2007	18-96	4332	95.2
Nigeria	NSMHW			2002-2003	18-100	6752	2143
PRC – Beijing/Shanghai	B-WMH/S-WMH			2002-2003	18-70	5201	74.7
Peru	EMSMP			2004-2005	18-65	3930	90.2
Total						(24641)	83.7
II. Upper-middle income							
Brazil – São Paulo	São Paulo Megacity	São Paulo metropolitan area		2005-2007	18-93	5037	81.3
Bulgaria	NSHS	Nationally representative		2003-2007	18-98	5318	72.0
Colombia – Medellín <sup>d</sup>	MMHS	Medellin metropolitan area		2011-2012	19-65	3261	97.2
Lebanon	LEBANON	Nationally representative		2002-2003	18-94	2857	70.0
Mexico	M-NCS	All urban areas of the country (approximately 75% of the total national population)		2001-2002	18-65	5782	76.6
Romania	RMHS	Nationally representative		2005-2006	18-96	2357	70.9
Total						(24612)	77.2
III. High income							
Argentina	AMHS	Nationally representative		2015	18-98	3927	77.3
Belgium	ESEMed	Nationally representative. The sample was selected from a national register of Belgium residents		2001-2002	18-95	2419	50.6
France	ESEMed	Nationally representative. The sample was selected from a national list of households with listed telephone numbers		2001-2002	18-97	2894	45.9
Germany	ESEMed	Nationally representative		2002-2003	19-95	3555	57.8
Israel	NHS	Nationally representative		2002-2004	21-98	4859	72.6
Italy	ESEMed	Nationally representative. The sample was selected from municipality resident registries		2001-2002	18-100	4712	71.3
Japan	WMHJ 2002-2006	Eleven metropolitan areas		2002-2006	20-98	4129	55.1
The Netherlands	ESEMed	Nationally representative. The sample was selected from municipal postal registries		2002-2003	18-95	2372	56.4
Portugal	NMHS	Nationally representative		2008-2009	18-81	3849	57.3
Spain	ESEMed	Nationally representative		2001-2002	18-98	5473	78.6
Spain – Murcia	PEGASUS-Murcia	Murcia region		2010-2012	18-96	2621	67.4
USA	NCS-R	Nationally representative		2002-2003	18-99	9282	70.9
Total						(50092)	64.2
IV. Total, all countries						99345	71.3

NSMH, The Colombian National Study of Mental Health; IMHS, Iraq Mental Health Survey; NSMHW, The Nigerian Survey of Mental Health and Wellbeing; PRC, People's Republic of China; B-WMH, The Beijing World Mental Health Survey; S-WMH, The Shanghai World Mental Health Survey; EMSMP, La Encuesta Mundial de Salud Mental en el Perú; NSHS, Bulgaria National Survey of Health and Stress; MMHS, Medellín Mental Health Household Study; LEBANON, Lebanese Evaluation of the Burden of Ailments and Needs of the Nation; M-NCS, The Mexico National Comorbidity Survey; RMHS, Romania Mental Health Survey; AMHS, Argentina Mental Health Epidemiologic Survey; ESEMed, The European Study of The Epidemiology of Mental Disorders; NHS, Israel National Health Survey; WMH2002-2006, World Mental Health Japan Survey; NMHS, Portugal National Mental Health Survey; PEGASUS-Murcia, Psychiatric Enquiry to General Population in Southeast Spain-Murcia; NCS-R, The US National Comorbidity Survey Replication.

a. World Bank (2012) data (accessed May 12, 2012 at: <http://data.worldbank.org/country>). Some of the WMH countries have moved into new income categories since the surveys were conducted. The income groupings above reflect the status of each country at the time of data collection. The current income category of each country is available at the preceding URL.

b. Most WMH surveys are based on stratified multistage clustered area probability household samples in which samples of areas equivalent to counties or municipalities in the USA were selected in the first stage followed by one or more subsequent stages of geographic sampling (for example, towns within counties, blocks within towns, households within blocks) to arrive at a sample of households, in each of which a listing of household members was created and one or two people were selected from this listing to be interviewed. No substitution was allowed when the originally sampled household resident could not be interviewed. These household samples were selected from census area data in all countries other than France (where telephone directories were used to select households) and the Netherlands (where postal registries were used to select households). Several WMH surveys (Belgium, Germany, Italy, Poland) used municipal or country resident registries to select respondents without listing households. The Japanese sample is the only totally un-clustered sample, with households randomly selected in each of the 11 metropolitan areas and one random respondent selected in each sample household. 15 of the 23 surveys are based on nationally representative household samples.

c. The response rate is calculated as the ratio of the number of households in which an interview was completed to the number of households originally sampled, excluding from the denominator households known not to be eligible either because of being vacant at the time of initial contact or because the residents were unable to speak the designated languages of the survey. The weighted average response rate is 71.3%.

d. Colombia moved from the 'lower- and lower-middle-income' to the 'upper-middle-income' category between 2003 (when the Colombian National Study of Mental Health was conducted) and 2010 (when the Medellín Mental Health Household Study was conducted), hence Colombia's appearance in both income categories. For more information, please see footnote a.

NSMH, The Colombian National Study of Mental Health; IMHS, Iraq Mental Health Survey; NSMHW, The Nigerian Survey of Mental Health and Wellbeing; PRC, People's Republic of China; B-WMH, The Beijing World Mental Health Survey; S-WMH, The Shanghai World Mental Health Survey; EMSMP, La Encuesta Mundial de Salud Mental en el Perú; NSHS, Bulgaria National Survey of Health and Stress; MMHS, Medellín Mental Health Epidemiologic Survey; ESEMed, The European Study of The Epidemiology Of Mental Disorders; NHS, Israel National Health Survey; WMHJ2002-2006, World Mental Health Survey; NMHS, Portugal National Mental Health Survey; PEGASUS-Murcia, Psychiatric Enquiry to General Population in Southeast Spain-Murcia; NCS-R, The US National Comorbidity Survey Replication.

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## Undertreatment of people with major depressive disorder in 21 countries

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### Supplementary Material

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